

## CLAIMS

1. A doubly balanced wide band mixer for a high frequency upconverter  
comprising:

an insulated substrate;

a local oscillator balun comprising first and second annular foil elements

5 juxtaposed on opposite sides of said substrate;

electrical interconnections interconnecting said first and second foil elements on  
said substrate;

an IF balun comprising third and fourth annular foil elements juxtaposed on  
opposite sides of said substrate and displaced from said first and second foil elements; and

10 RF switching means coupled between said local oscillator balun and said IF  
balun.

2. The mixer of claim 1, further comprising:

a buffer amplifier and a balun on said substrate for coupling a local oscillator signal  
to said local oscillator balun.

3. The mixer of claim 2, further including DC isolation capacitances in said local  
oscillator balun; and

means for supplying DC operating potential to said buffer amplifier through said  
balun to said local oscillator balun.

4. The mixer of claim 3, further including:

gaps in said first foil element; and

said DC isolation capacitances being connected across said gaps.

5. The mixer of claim 4, wherein said RF switching means comprises a mixer diode network including a plurality of reverse biasing R/C circuits.

6. The mixer of claim 4, wherein said RF switching means comprises MESFET switches.

7. A doubly balanced mixer for a high frequency upconverter comprising:

an insulated substrate;

a local oscillator balun having a split annular first foil element on one side of said substrate and an open annular second foil element on the opposite side of said substrate;

electrical connections interconnecting said split annular first foil element and said open annular second foil element;

a buffer amplifier and a balun on said substrate for coupling an oscillator signal to said local oscillator balun;

an IF balun comprising third and fourth annular foil elements juxtaposed on opposite sides of said substrate in mutual coupling relationship with each other; and

RF switching means coupled between said local oscillator balun and said IF balun.

8. The mixer of claim 7, further including isolation capacitances in said local oscillator balun; and

means for supplying DC operating potential to said buffer amplifier through said balun and a portion of said local oscillator balun.

9. The mixer of claim 8, further including:

gaps in said first foil element; and

said DC isolating capacitances being connected across said gaps.

10. The mixer of claim 9 wherein said RF switching means comprises:

a mixer diode network; and

a plurality of R/C circuits for reverse biasing said mixer diode network.

11. The mixer of claim 9, wherein said RF switching means comprises a pair of MESFET switches.

12. A double balanced mixer comprising:

a source of a symmetrical local oscillator signal;

a switching circuit controlled by said local oscillator signal;

a source of RF signal; and

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5 a printed output circuit having a wideband response for receiving said RF signal and connected to said switching circuit for producing a narrow band IF output signal comprising the frequency difference between said local oscillator signal and said RF signal.

13. The mixer of claim 12, wherein said output circuit includes parallel tuned elements exhibiting said wideband response and series tuned elements exhibiting said narrow band response.

14. The mixer of claim 12 wherein said switching circuit comprises first and second switches, each having a control terminal connected to receive said local oscillator signal, an output terminal and a third terminal connected to ground; said first and second switches being alternately turned on and off in response to said local oscillator signal.

15. The mixer of claim 14, wherein said first and second switches comprise MESFET devices, each having a gate electrode corresponding to said control electrodes, respectively.

16. The mixer of claim 15, further including an insulated substrate and wherein said output circuit comprises a printed IF balun having a first foil element connected to said switching circuit and said RF signal source and a second foil element displaced from said first foil element on opposite sides of said insulated substrate for producing said IF output signal.

17. The mixer of claim 16, wherein said first foil element is in a parallel tuned circuit and said second foil element is in a series tuned circuit.

18. A double balanced mixer comprising:

a source of a symmetrical local oscillator signal;

a switching circuit controlled by said local oscillator signal, said switching circuit comprising first and second MESFET switches, each having a gate electrode connected to receive  
5 said local oscillator signal, an output terminal and a third terminal connected to ground;

said first and second MESFET switches being alternately turned on and off in response to said local oscillator signal;

a source of RF signal;

an insulated substrate; and

10 a printed output circuit having a wideband response for receiving said RF signal and connected to said switching circuit for producing a narrow band IF output signal comprising the frequency difference between said local oscillator signal and said RF signal;

said printed output circuit including a printed IF balun having a first foil element, in a parallel tuned circuit, connected across said output terminals and a second foil element, in a  
15 series tuned circuit, displaced from said first foil element on opposite sides of said insulated substrate.